

• • R E M A R K S • •

The Official Action of March 10, 2003 has been thoroughly studied. Accordingly, the changes presented herein for the application, considered together with the following remarks, are believed to be sufficient to place the application into condition for allowance.

In response to the Examiner's request that applicants review and revise the specification so that it complies with 35 U.S.C. §112, applicants are hereby submitting a Substitute Specification under 37 CFR §1.125(b). The Substitute Specification is believed to conform to the requirements of 35 U.S.C. §112.

By the present amendment, independent claim 1 has been changed to recite that the liquid-absorbent core that has at least one compressed groove formed therein and superabsorbent polymer particles that are disposed in a continuous manner in a single zone within the core between the topsheet and the backsheet which single zone is substantially coextensive with the length and width of the core and along the bottom of the at least one groove with a higher concentration of the superabsorbent polymer particles within a vicinity of the at least one groove.

Support for this change to claim on can be readily found in the applicants' drawings.

Also by the present amendment, claim 4 has been changed to recite that an upper zone of the core above the single zone containing the superabsorbent polymer particles has a higher concentration of the water-absorbent fibers than the single zone containing the superabsorbent polymer particles.

Claim 8 has been corrected in the manner suggested by the Examiner.

New dependent claims 10 and 11 have been added which respectfully recite that the core contains at least 20 % by weight of thermoplastic synthetic fibers and that the thermoplastic synthetic fibers have a melting point of $100\text{ }^{\circ}\text{C} \pm 20\text{ }^{\circ}\text{C}$.

Support for new claims 10 and 11 can be found in the paragraph bridging pages 7 and 8 of applicants' original specification.

The Abstract of the disclosure has been changed in the manner suggested by the Examiner.

Applicants are submitting herewith a proposed correction for Fig. 1 which deletes the reference numerals 15A.

Entry of the Substitute Specification, amendments to the claims and Abstract and proposed drawing amendment are respectfully requested.

On page 2 of the Official Action the Examiner has objected to the abstract of the disclosure and has indicated that in line 3 "a" should be changed to "the." The Examiner's suggested change has been adopted by applicants in the present amendment.

Also on page 2 of the Official Action the Examiner offered some suggested changes for the specification and further requested that applicants carefully review and revise the specification so that it complies with 35 U.S.C. §112. The Substitute Specification being submitted herewith is believed to address this matter.

The drawings stand objected to because the description of Fig. 1 was inaccurate. As indicated by the Examiner Fig. 1 was a "partly cut away" view. Rather than submit a drawing correction to address this issue, applicants have amended the description of the drawing in specification.

There is a second objection to drawings in which the Examiner requested that the drawings show the features of the invention set forth in claims 2-3 and 6.

Claims 2 and 3 are directed to the use of an adhesive that is used to join the polymer particles together with the absorbent and diffusive sheet 33. Claim 6 recites that the density of the polymer particles increases in the thickness direction of the core from the topsheet toward the backsheet.

It is respectfully submitted that specific illustrations of the features of claims 2, 3 and 6 are not required for provide an understanding of applicants' claimed invention.

37 CFR §1.1.83 indicates that "conventional features disclosed in the description and claimed" which are "not essential for a proper understanding of the invention" do not have to be specifically shown in the drawings.

In the present case, a specific depiction of the adhesive is not believed to be necessary inasmuch as one skilled in the art would readily understand how to incorporate the adhesive into the diaper structure. Likewise, it is believed that the depiction of a gradient of the polymer particles in an illustration is not believed to be necessary for one skilled in the art to understand applicants' invention.

The Examiner is respectfully requested to reconsider and withdraw the second objection to the drawings found on page 2 of the Official Action.

On page 3 of the Official Action the Examiner has objected to the disclosure because of several informalities.

In response to this objection, the specification has been appropriately amended herein.

Claims 8 and 9 stand objected to on page 3 of the Official Action. Under this objection the Examiner has indicated that "a" should be deleted from line 2 of claim 8.

Claim 8 has been appropriately amended.

Claim 4 stands rejected under 35 U.S.C. §112, second paragraph. Under this rejection the Examiner has question the scope of the phrases “thin layer” and “around a depth of said core.”

By the present amendment, claim 4 has been changed to recite that an upper zone of the core above the single zone containing the superabsorbent polymer particles has a higher concentration of the water-absorbent fibers than the single zone containing the superabsorbent polymer particles.

Claims 1-3, 5 and 7-9 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,451,442 to Pieniak et al.

Claims 1-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,459,016 to Rosenfeld et al. in view of Pieniak et al.

For the reasons set forth below, it is submitted that all of the pending claims are allowable over the prior art of record and therefore, each of the outstanding rejections of the claims should properly be withdrawn.

Favorable reconsideration by the Examiner is earnestly solicited.

Pieniak et al. discloses an absorbent panel structure that is provided with “superabsorbent stripes 42” that are aligned along the length of the panel.

Rosenfeld et al. discloses an absorbent article that is provide with at least 2 high absorbency zones that comprise discrete layers that are spaced apart at different depths of an absorbent element.

Applicants’ invention as disclosed and claimed includes a liquid-absorbent core that has at least one compressed groove formed therein and superabsorbent polymer particles that are disposed in a continuous manner in a single zone within the core between the topsheet and the backsheet which single zone is substantially coextensive with the length and width of the core and along the

bottom of the at least one groove with a higher concentration of the superabsorbent polymer particles within a vicinity of the at least one groove.

The art recognizes that superabsorbent polymer particles develop “gel-blocking” which is a phenomenon that occurs when adjacent particles swell upon absorption of liquids and become packed tightly together and form a block or barrier to further liquid absorption/transfer.

Rosenfeld et al. discusses and solves a problem associated with gel-blocking by distributing a desired amount of superabsorbent polymer particles (enough to contain a predicted amount of liquid) in two or more spaced apart layers or “high absorbency zones.”

Pieniak et al. notes at column 2, lines 21-25 that “the structure of the absorbent layer containing superabsorbent material appears to be critical.”

Pieniak et al. accordingly broadly teaches uniformly distributing superabsorbent particles throughout panel structure 14 or along a central zone, but preferably teaches the use of discrete “spaced apart strips or bands 42 along the length of the panel.”

Applicants’ invention, as discussed on pages 6-7 involves a unique structure in which the liquid-absorbent core has at least one compressed groove formed therein and superabsorbent polymer particles that are disposed in a continuous manner in a single zone within the core between the topsheet and the backsheet which single zone is substantially coextensive with the length and width of the core and along the bottom of the at least one groove with a higher concentration of the superabsorbent polymer particles within a vicinity of the at least one groove.

This structure results in a unique function in which gel-blocking of the higher concentration of the superabsorbent polymer particles within the vicinity of the groove adds structural support to

the groove and prevents the groove from being collapsing and still allows absorption of fluids by non-gel-blocked areas of the core which lie outside of the vicinity of the groove.

Neither Pieniak et al. or Rosenfeld et al. teach or suggest applicants' claimed structure.

Moreover, neither Pieniak et al. nor Rosenfeld et al. teach or suggest the unique function associated with applicants' claimed invention.

Accordingly, it is submitted that applicants' claimed invention is both structurally and functionally distinguishable over Pieniak et al. and Rosenfeld et al., considered alone or in combination together.

Based upon the above distinctions between the prior art relied upon by the Examiner and the present invention, and the overall teachings of prior art, properly considered as a whole, it is respectfully submitted that the Examiner cannot rely upon the prior art as required under 35 U.S.C. §102 as anticipating applicants' claimed invention.

Moreover, it is submitted that the Examiner cannot properly rely upon the prior art under 35 U.S.C. §103 to establish a *prima facie* case of obviousness of applicants' claimed invention.

It is, therefore, submitted that any reliance upon prior art would be improper inasmuch as the prior art does not remotely anticipate, teach, suggest or render obvious the present invention.

It is submitted that the claims, as now amended, and the discussion contained herein clearly show that the claimed invention is novel and neither anticipated nor obvious over the teachings of the prior art and the outstanding rejection of the claims should hence be withdrawn.

Therefore, reconsideration and withdrawal of the outstanding rejection of the claims and an early allowance of the claims is believed to be in order.

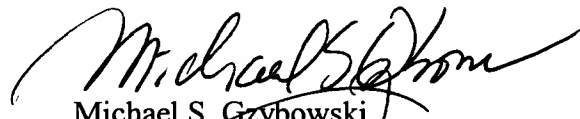
It is believed that the above represents a complete response to the Official Action and reconsideration is requested.

The prior art noted on page 5 of the Official Action, but not relied upon by the Examiner, has been noted. This prior art is not deemed to be particularly pertinent to applicants' claimed invention.

If upon consideration of the above, the Examiner should feel that there remain outstanding issues in the present application that could be resolved; the Examiner is invited to contact applicants' patent counsel at the telephone number given below to discuss such issues.

To the extent necessary, a petition for an extension of time under 37 CFR §1.136 is hereby made. Please charge the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 12-2136 and please credit any excess fees to such deposit account.

Respectfully submitted,



Michael S. Gzybowski
Reg. No. 32,816

BUTZEL LONG
350 South Main Street
Suite 300
Ann Arbor, Michigan 48104
(734) 995-3110

Marked-Up Copy of the Claims
As Amended on June --, 2002

1. (Twice Amended) A disposable diaper comprising:

a liquid-pervious topsheet;

a liquid-impervious backsheet;

a liquid-absorbent core having a length, width and thickness and being covered with an absorbent and diffusive sheet and disposed between said topsheet and said backsheet;

said core being formed on a side facing said topsheet with at least one groove depressed in a direction from a side of said topsheet toward a side of said backsheet, said at least one groove having a bottom and side walls both covered with said topsheet;

said core containing water-absorbent fibers and superabsorbent particles; and

said water-absorbent fibers and superabsorbent polymer particles being [partially] disposed in a continuous manner in a single zone within the core between said topsheet and said backsheet which single zone is substantially coextensive with the length and width of the core and along said bottom of said at least one [groove.] groove with a higher concentration of the superabsorbent polymer particles within a vicinity of the at least one groove.

4. (Twice Amended) The disposable diaper according to Claim 1, wherein an upper zone of the core above the single zone containing the superabsorbent polymer particles has a higher concentration of said water-absorbent fibers [form a thin layer having a density higher than a density of said water-absorbent fibers around a depth of said core, said thin layer being in close contact with

said absorbent and diffusive sheet.] than the single zone containing the superabsorbent polymer particles.

8. (Twice Amended) The disposable diaper according to Claim 7, wherein said at least one groove comprises at least two grooves and said crotch region is formed along [a] transversely opposite side edge portion thereof with said at least two grooves, respectively, extending in said longitudinal direction in parallel to each other.

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MARKED-UP COPY OF
SUBSTITUTE SPECIFICATION

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DISPOSABLE DIAPER

5

BACKGROUND OF THE INVENTION

This invention relates to a disposable diaper for absorption and containment of excrement.

Japanese Utility Model Application Publication No.

10 1989-141707A describes a disposable diaper having [its] an absorbent
pad that is divided into a plurality of pad sections. Each of
the pad sections comprises a mixture of fluff pulp
fibers/superabsorbent polymer particles and a topsheet [is] joined
to a backsheet around the pad section so that a groove depressed
15 from the side of the topsheet toward the side of the backsheet
may be defined between each pair of the adjacent pad sections.

Japanese Patent Application Publication No. 1997-51913A
describes a disposable absorbent undergarment [including] that
includes a liquid-absorbent core formed with a plurality of slits
20 extending through a thickness direction of the core and arranged
intermittently in a longitudinal direction of the undergarment

as well as in a transverse direction orthogonal to the longitudinal direction so that [top- and backsheets] topsheet and backsheet may be bonded together along the slits.

With conventional disposable undergarments, the [top- and
5 backsheets] topsheets and backsheets are joined together at bottoms
of [the] grooves or [slits, so] slits. As a result, the amount
8-12 of urine flowing into the grooves or slits can only be absorbed
by the core [only] through side walls of the grooves or slits.
With such undergarment, the surface area of the core that is available
10 to absorb body fluids is reduced as the width of the groove or
slit is enlarged. Consequently, the absorption rate and capacity
for body fluids [should be] is correspondingly reduced.

SUMMARY OF THE INVENTION

15 It is an object of this invention to provide a disposable
diaper [improved] designed so that a width of each groove [to be]
formed on the side of the diaper's topsheet can be enlarged without
reduction in the surface area of the core available to absorb body
fluids.

20 This invention provides a disposable diaper comprising a
liquid-pervious topsheet, a liquid-impervious backsheet and a

liquid-absorbent core covered with an absorbent and diffusive sheet and disposed between these [two sheets.] the topsheet and the backsheet. The core is formed on a side of the topsheet with at least one groove depressed in a direction from a side of the
5 topsheet toward a side of the [backsheet and the] backsheet. The groove has a bottom and side walls are both covered with the topsheet.

The core contains water-absorbent fibers and superabsorbent polymer particles. The water-absorbent fibers and superabsorbent polymer particles are partially disposed between the [top- and
10 backsheets] topsheet and backsheet along the bottom of the groove.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a partly cut away plan view showing a diaper according to a typical embodiment of [this] the invention;

15 2-03
4-1
8 Fig. 2 is a sectional view taken along [a] section line II
- II in Fig. 1;

Fig. 3 is a view similar to that in Fig. 1, showing another embodiment of [this] the invention;

Fig. 4 is a view similar to that in Fig. 2, showing still
20 another embodiment of [this] the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Details of a disposable diaper according to this invention will be more fully understood from the description of its embodiments given hereunder with reference to the accompanying drawings.

5 [A diaper] Diaper 1 shown [by] in Fig. 1 in a partially cutaway plan view comprises a liquid-pervious topsheet 2, a liquid-impervious backsheet 3 and a liquid-absorbent core 4 disposed between [these two sheets 2, 3.] topsheet 2 and backsheet 3. The diaper 1 has a front waist region 6, a rear waist region 7 and
10 a crotch region 8 [extending] that extends between [these two waist regions 6, 7.] front waist region 6 and rear waist region 7. The [top- and backsheets 2, 3] topsheet 2 and backsheet 3 extend outward beyond a peripheral edge of the core 4 [and are overlapped to each other and] so as to overlap one another. The overlapped portions
15 of the topsheet 2 and backsheet 3 are water-tightly joined [together over these extensions.] together. Elastic members 16 and 17 are secured under tension to the inner surface of the topsheet 2 and/or backsheet 3 along respective [Along] longitudinally outer end portions 11, 12 of the front and waist regions 6, 7 so as to be
20 associated with a waist-opening. Likewise, elastic members 18 are secured under tension to the inner surface of the topsheet

2 and/or backsheet along [and] transversely opposite side edge portions 13 of the crotch region [8, respectively, elastic members 16, 17] so as to be associated with leg-openings. [a waist-opening and elastic members 18 associated with leg-openings are secured under tension to the inner surface of the topsheet 2 and/or the backsheet 3.] The rear waist region 7 is provided on [its] transversely opposite side edge portions 19 with tape fasteners 21. Grooves 15 are formed in [On] the inner surface of the diaper 1 along [1, the core 4 is formed on its] transversely opposite side edge portions 22 of the core 4. [with] The grooves 15 [extending] extend in parallel to each other in the longitudinal direction of the diaper 1.

Fig. 2 is a sectional view taken along [a] section line II - II in Fig. 1. The core 4 comprises a mixture of fluff pulp fibers 31 and superabsorbent polymer particles 32 and is entirely wrapped [with] in an absorbent and diffusive sheet 33 such as tissue paper. The core 4 has a thickness t in a transversely middle zone of the crotch region 8. Along each of the grooves 15, the core 4 is depressed in a direction from the topsheet 2 toward the backsheet 3. The [groove 15 has its] inner surface of groove 15 is covered with the topsheet 2 and the absorbent and diffusive sheet 33 lies directly

[underlies] beneath the topsheet 2. The groove 15 has a bottom 34 and side walls 36. Referring to Fig. 2, d designates a depth of the groove 15 as measured from a body-side surface 37 of the diaper 1 in the vicinity of the groove 15 to the bottom 34, p designates a thickness of the core 4 as measured from the bottom 34 to the backsheet 3 and w designates a width of the groove 15 as measured at the level of the body-side surface 37.

In [such] diaper 1, the core 4 preferably has a basis weight of about 200 - 700 g/m², a thickness t of about 2 - 20 mm and contains
10 about 98 - 5 % by weight of comminuted pulp [by about 98 - 5 %
by weight] and about 2 - 95 by weight of superabsorbent polymer

polymer
particles
particles. [particles 32 at ~~about~~ 2 - 95 % by weight.] [A] The

density at which the polymer particles 32 are distributed within
the core 4 gradually [become higher] increases in the thickness
15 direction of the core 4 from the topsheet 2 toward the backsheet
3. The polymer particles 32 are present [also] in the vicinity

of the bottom 34 as well as in the vicinity of the side walls 36
of the groove 15 and are partially joined together with the absorbent
and diffusive sheet 33 by means of an appropriate adhesive such
as a hot melt adhesive (not shown). [Such joining together] Joining

5 of the polymer particles 32 and the absorbent and diffusive sheet
33 may also be achieved [also] by compressing at least one of the
core 4 and the absorbent and diffusive sheet 33 in desired regions

*pm
8-12-07* under wet [condition.] conditions, The absorbent and diffusive
sheet 33 is joined to the topsheet 2 over the bottoms 34 and the

10 side walls 36 of groove 15 by means of an adhesive (not shown).

The groove 15 preferably has [the] a width w of about 2 - 20 mm,
a length L (See Fig. 1) of at least 20mm and the depth d corresponding
to about 10 - 90 % of the thickness t of the core 4. The thickness
p of the core 4 as measured from the bottom 34 of the groove 15

to the backsheet 3 corresponds to about 10 - 90 % of the thickness
t of the core 4.

Such a unique arrangement of the diaper 1 allows an amount
of body fluids, for example, urine flowing on the topsheet 2
5 transversely of the diaper 1 to be collected in the grooves 15
and thereby [to prevent] the amount of body fluids is prevented
from leaking sideways. The amount of body fluids collected in
the grooves 15 [then] spreads in the longitudinal direction of
the diaper 1 along the respective grooves 15, and is thereupon
10 absorbed by the core 4 [over] through the bottoms 34 and the side
walls 36. A plurality of superabsorbent polymer particles 32 joined
to the absorbent and diffusive sheet 33 defining the bottoms 34
as well as the side walls 36 swell as soon as they absorb the body
fluids and cohere together so as to form gel block extending along
15 the surface of the respective grooves 15. The presence of such
gel block serves to protect the grooves 15 from completely collapsing
under a wearer's body weight and, in consequence, having their
function impaired. It should be understood here that the gel block
also functions [also] to obstruct further permeation of the body
20 fluids into a depth of the core 4. To overcome this problem, it

is preferred to distribute the fluff pulp fibers 31 at a density higher than that of the superabsorbent polymer particle 32 in the vicinity of tops of the respective side walls 36 as will be best seen in Fig. 2. In the vicinity of the entire side walls 36, the
5 superabsorbent polymer particles 32 may be mixed with sufficient amount of the fluff pulp fibers 31 so that the fluff pulp fibers 31 may partially extend through the gel block and thereby assist the body fluids [to permeate] in permeating from the grooves 15 further into the depth of the core 4.

10 As will be apparent from the foregoing description, the core 4 is adapted to not only absorb the body fluids [not only] through its flat body-side surface [37] but also through the bottoms 34 and the side walls 36 of the respective grooves 15. This feature [can] reliably [overcome] overcomes the disadvantage
15 [accompanying] associated with the diaper of prior [art such that] art, i.e. when the grooves formed by joining the [top- and back sheets] topsheet and backsheet together necessarily reduces the surface area of the core that is available to absorb the body fluids. Along the bottoms 34 and the side walls 36 of the core 4, the superabsorbent
20 polymer particles 32 are joined to the absorbent and diffusive sheet 33 so that the polymer particles 32 [might be] are not scattered

far away [far] from the vicinity of the grooves 15 even when the grooves 15 are more or less deformed as a wearer's body weight is exerted on the core 4. The core 4 may contain 20 % by weight or less of thermoplastic synthetic fibers [by 20 % by weight or less] and [more] preferably thermoplastic synthetic fibers that have [having] a melting point of $100^{\circ}\text{C} \pm 20^{\circ}\text{C}$. When the core 4 is partially heated under [a] pressure to form the grooves 15, the thermoplastic synthetic resin [is molten and deformed] melts and deforms to facilitate the formation of the grooves 15.

[Distribution] The distribution of the polymer particles 32 in the core 4 may be varied [depending on the particular] in different regions of the core 4. For example, [a] the density at which the polymer particles 32 are distributed in the region defined between the transversely adjacent grooves 15, 15 may be adjusted to be higher than [that] the density at which the polymer particles 32 are distributed outside the respective grooves 15 in order to ensure that most of the body fluids is absorbed by the core 4 in the region defined between the grooves 15, 15 and thereby [to] prevent the body fluids from leaking sideways.

Fig. 3 is a view similar to that in Fig. 1, showing another embodiment of [this] the invention. The diaper 1 shown [by] in

Fig. 3 has [is formed in its transversely middle zone with] two
grooves 15 formed in the diaper's transversely middle zone which
grooves 15 extend [extending] in the longitudinal direction of
thediaper1. [Althoughthese] Thesetwogrooves15 [areillustrated
5 to] canbespacedapartfromeachotherinthelongitudinaldirection,
if desired. The groove 15 in Fig. 3 has the same cross-sectional
shape as that of the groove 15 illustrated in Fig. [2 and most]
2. Most of the body fluids discharged on the diaper 1 flow in
the groove(s) 15 longitudinally [extending] in the middle zone
10 and then are rapidly absorbed by the core 4 through the bottoms
34 and the side walls 36. In this way, the amount of the body
fluids [possibly] capable of flowing in the transverse direction
of the diaper 1 [can be correspondingly] is limited. Therefore,
[the groove(s)] according to this embodiment [also] the groove(s)
15 can prevent the body fluids from leaking sideways [of] with respect
to the diaper 1 without reducing the surface area of the core 4
that is available to absorb the body fluids.

Fig. 4 is a view similar to that in Fig. 2, still another
embodiment of [this] the invention. In the case of this diaper
20 1, a thin layer 41 of the fluff pulp fibers 31 is closely joined
to the inner surface of the absorbent and diffusive sheet 33 along

the bottoms 34 and the side walls 36 of the grooves 15. The density
of the fluff pulp fibers 31 is [distributed at a density] higher
[than its density around the depth of the core 4.] in a thin layer
41 around grooves 15 as shown in Fig. 4. The superabsorbent polymer
5 particles 32 are present inside this thin layer 41. [With] In
this diaper 1, [1 also,] the surface area of the core 4 that is
available to absorb the body fluids is not reduced by the presence
of the grooves [15] 15, because [and] the thin layer 41 containing
the higher density of fluff pulp fibers [at high density can
10 accelerate] accelerates the flow of body [fluids flowing] into
the grooves 15 [to be absorbed] for subsequent absorption by the
core 4.

The [diaper 1 according to this] present invention is
applicable to [a] baby [diaper] diapers and [as well as to an]
15 adult [diaper.] diapers. Furthermore, [this] the invention can
be [implemented not only] in the form of an open-type diaper as
illustrated in the figures and [but] also in the form of pants-type
[diaper] diapers in which the front waist region 6 and the rear
waist region 7 have been connected to each other along transversely
20 opposite side edge portions thereof by means of welding or the
other appropriate [technique.] techniques.

In the disposable diaper according to this invention, the superabsorbent polymer particles and the fluff pulp fibers are disposed between the [top- and backsheets] topsheet and backsheet in the vicinity of the bottoms of the grooves formed [on] in the core and consequently [there is no problem that] the surface area of the core that is available to absorb the body fluids [might be] is not reduced by the presence of the grooves.

[Along the respective grooves formed on the core, the] The superabsorbent polymer particles are joined integrally with the absorbent and diffusive sheet along the respective grooves. The absorbent and diffusive sheet is [which is, in turn,] in close contact with the inner surface of the topsheet. This arrangement [can reliably avoid the anxiety that] prevents the superabsorbent polymer particles [might be] from being scattered far away [far] from the vicinity of the grooves even when the grooves are deformed under exertion of a wearer's body weight [exerted] thereon.

Marked-Up Copy of the Abstract
As Amended on June --, 2002

10/12
8-12-03

A disposable diaper that is composed of a liquid-permeable topsheet, a liquid-impermeable backsheet and a liquid-absorbent core. The core is formed with grooves each depressed in a direction from the side of the ^[4] topsheet toward the side of the ^[4] backsheet. The core contains water-absorbent fibers and superabsorbent polymer particles. These fibers and particles are disposed between portions of the topsheet covering bottoms and side walls of the grooves, and portions of the backsheet respectively opposed to the corresponding portions of the topsheet.